Response of Sakkoti Date Palms to Application of Poultry Manure Tea And Effective Microorgansmis as A Replacement of Inorganic Nitrogen Fertilization

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Abstract: This study was carried out during 2016 and 2017 seasons to examine the effect of replacing 25 to 100 % inorganic N by using 25 to 100% poultry manure tea and 50 to 200 ml EM/palm/year on growth, palm nutritional status, flowering and fruit setting aspects, yield, bunch weight and fruit quality of Sakkoti date palms. Using N as 50% inorganic N+50% poultry manure tea + 100 ml EM/palm/year materially maximized all growth aspects, flowering, fruit setting %, yield and bunch weight. Leaf chemical components and quality parameters were gradually enhanced with reducing inorganic N percentages and at the same time increasing percentages of poultry manure tea and EM levels. The best results with regard to fruit quality were observed with using N as 100% poultry manure tea + 200 ml EM/palm/year. For improving yield and controlling nitrate and nitrite pollution, it is suggested to fertilize Sakkoti date palms with 50% inorganic N+50% poultry manure tea + 100 ml EM/palm/year.
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1. Introduction

Poor yield of Sakkoti date palms grown under Aswan region is considered a problem. This is attributed to unbalancing N nutrition.

Organic farming in agriculture is a unique production management system which promotes and enhances agro-eco system of health including biodiversity, biological cycles and soil biological activity. It has been systematically followed on a large scale in the developed countries including Egypt. (**Dahama, 1999**).

Clean cultivation is suggested to be one possibility to restore the natural conditions and it has become in the last few decades a positive alternative to chemical fertilizers. Thus, it is preferred to use these natural fertilizers to avoid pollution and to reduce the costs of chemical fertilizers. The accumulation of heavy metals results from continuous use of mineral fertilizers causes a lot of serious diseases for human.

Using N as inorganic and organic N forms **(Osman, 2003; Mansour *et al.,* 2004; Mohamed and Ragab, 2004; Mohamed and Gobara, 2004; Gobara and Ahmed, 2004; Abdel El-Hameed and Ragab, 2004; El-Salhy, 2008; Al-Wasfy and El-Khawaga, 2008; Ibrahiem- Zeneib, 2010; Souna-Faiza *et al,* 2010; Roshdy, 2010; Saied, 2011; Mahfouz, 2011; Saad *et al,* 2011; Faraag, 2013; Ahmed *et al.,* 2014 a & b and Omar, 2015)** and application of EM **(Kannaiyan, 2002; Abd-Rabou, 2006; Formowitz *et al,* 2007; Ahmed- Samah, 2011; Roshdy *et al,* 2011; Ibrahiem, 2012; Refaai and Ahmed, 2013 and Ahmed *et al.,* 2014 a & b**) as a partial replacement of inorganic N was accompanied with improving yield and fruit quality of fruit crops.

The target of this study was examining the effect of N (inorganic and organic) at various proportions and EM on vegetative growth characters, leaf mineral content, yield and fruit quality of Sakkoti date palms grown under Aswan conditions. Selecting the best proportion of inorganic and organic of N besides the levels of EM that are responsible for obtaining an economical yield and reducing at the lower extent the pollution occurred by nitrite and nitrate is considered another target.

2. Materials and Methods

This study was conducted in a private orchard located at Edfo district, Aswan Governorate during 2016 and 2017 seasons. Fifteen offshoots derived Sakkoti dry date palms were selected for achieving this study. The palms were planted at 7 x 7 meters apart. The texture of soil is silty clay **(Table 1)**.

The selected palms were at the same age and uniform in vigour. These palms were 15-years old at the start of this study, good physical conditions and free from insects, damages and diseases. The selected palms were irrigated through surface irrigation system. Pruning was perform to maintain leaf bunch ratio at 8: 1 (according to **Sayed, 2002**).

The number of female spathes per palm was adjusted to 10 spathes. Pollination was achieved by inserting five male strands into the female bunch

using known high activity pollen source throughout 2-3 days after female spathe cracking.

Every bunch was bagged after inserting the male strands by paper bags (according to **Hussein *et al,* 1993 and Dammas, 1998**). Before carrying out hand pollination, pollen grains viability and pollen germination were determined (**Al- Tahir and Asif, 1983**).

Table (1): Mechanical, physical and chemical analysis of the tested orchard soil:

Characters	values
Practical size distribution:	
Sand %	: 9.50
Clay %	: 32.50
Silt %	: 58.00
Texture grade	Silty clay
pH (1:2.5 extract)	: 7.94
E.C (1: 2.5 extract) (mmhos/ 1 cm)	: 0.88
Organic matter %	: 3.1
$CaCO_3$ %	: 1.47
Macronutrients values	
Total N %	: 0.12
P (ppm, Olsen method)	: 11.2
K (ppm, ammonium acetate)	: 430.0
Mg (ppm)	: 84.00
S (ppm)	: 5.81
B (hot water extractable)	: 0.24
ETA extractable (ppm)	
Zn	: 1.35
Fe	: 8.9
Mn	: 8.14
Cu	: 0.98

Each selected palm received the common horticultural practices that are already applied in the orchard except those dealing with inorganic, organic and biofertilization of N as well as using EM.

This experiment included the following five treatments from inorganic (ammonium nitrate, 33.5 %N), organic (Poultry manure, 2.5 %N) and EM:

1- Application of the suitable N (1000 g/ palm/ year) as 100 % inorganic source (2985.0 g. ammonium nitrate / palm/ year).

2- Application of the suitable N through 75% inorganic source (2239 g. ammonium nitrate/ palm/ year) + 25 % poultry manure tea (10 kg poultry manure/palm)+ 50 ml EM/palm/year.

3- Application of the suitable N through 50 % inorganic source (1493 g. ammonium nitrate/ palm/ year)+ 50 % poultry manure (20 kg poultry manure/palm)+ 100 ml EM/palm/year.

4- Application of the suitable N through 25 % inorganic source (746.3 g. ammonium nitrate/ palm/ year)+ 75 % poultry manure (30 kg poultry manure tea/palm)+ 150 ml EM/palm/year.

5- Application of the suitable N through 100 % poultry manure (40 kg poultry manure/palm)+ 200 ml EM/palm/year.

Each treatment was replicated three times, one Sakkoti date palm per each. Inorganic N source was applied in the source of ammonium nitrate. It was splitted into three equal batches and applied at the first week of March, May and July for the two consecutive seasons. Organic N fertilizer namely poultry manure tea (2.5 % N) was added once at the first week of Jan. during both seasons. It was prepared by weighing 10-40 kg poultry manure + 750 g molase + 10.09 sodium chloride + 55.09 magnesium sulphate per 100 liters water and left stand for three days. Then was agitated continuously and was used in the fourth day (according to **Ryan 2003**). The fresh EM (1ml contains 10^7 bacterial cells) at 50 to 200 ml/ palm/ year was also added once at the first week of March. Ammonium nitrate was distributed around the canopy of each palm wile, all organic and biofertilizers were applied in holes 10 cm depth around the canopy of each date. All the selected palms (15 palm) received N at fixed rate namely 1000 g N/ palm/ year (**Saied, 2011**).

Table (2) shows the chemical analysis of the studied poultry manure organic fertilizer.

Table (2): Analysis of poultry manure tea.

Parameters	Values
O.M. %	58.26
Organic carbon	27.90
pH (1: 2.5 extract)	10.25
E.C. (1: 2.5 extract) (dsm^{-1})	5.9
Total N %	2.5
Total P %	1.12
Total K %	1.21
Total Fe (ppm)	18.5
Total Zn (ppm)	43.22

This experiment was arranged in a randomized complete block design (RCBD). This experiment included five treatments and each treatment was replicated three times, one palm per each replicate.

During both seasons, the following parameters were recorded:

1- Vegetative growth characteristics namely length, width and area of leaflet (cm^2) and leaf, (m^2) **(Ahmed and Morsy, 1999)**, number of leaflet/ leaf total surface area per palm (m^2).

2- Leaf chemical composition namely total carbohydrates % **(A.O.A.C, 2000)**, leaf content of N, P, LK, Mg and Ca (as %) and Fe, Zn and Mn (as ppm) **(Summer, 1985 and Wilde *et al.,* 1985)** and C/N. Also, chlorophylls a & b, total chlorophylls and total carotenoids (mg/ 1 g F.W) **(Von-Wettstein, 1957).**

3- Flowering and fruit setting aspects namely girth (cm) and length (cm) of spathe, number of strands / spathe as well as number of flowers and fruits per strand, initial fruit setting % and fruit retention %.

4- Yield per palm expressed in weight (kg.) and bunch weight (kg.)

5- Physical and chemical characteristics of the fruits namely weight, volume, height and diameter of fruit, length and weight % of seed, flesh %, edible to non- edible portions of fruit, T.S.S. %, total, reducing and non- reducing sugars % **(Lane and Eynon, 1965 A.O.A.C, 2000)**, total acidity % (as g malic acid/100g pulp), crude fibre % **(A.O.A.C, 2000)**, total soluble tannins **(Balbaa, 1981)** and nitrate ad nitrite content in the flesh (ppm) **(Ridnour-Lisa *et al.*, 2000).**

Statistical analysis was done using new L.D.S. at 5% for differentiate among various treatment means (according to **Mead *et al,* 1993**).

3. Results

1- Vegetative growth characteristics:

It is clear from the obtained data in Table (3) that significant differences were observed on the ten growth characteristics (length, width and area of leaflet and leaf, number of leaf let/ leaf, total surface area per palm as well as number of spines/ leaf and spine length) were observed among the five N management treatments. Supplying the palms with N at 50 to 75% inorganic N+ 25 to 50% poultry manure tea+ 50 to 100 ml EM/palm/year significantly was followed by stimulating the previous ten vegetative growth aspects relative to using N as 100% inorganic N or when inorganic N was added at percentages lower than 50% (including the use of 25 or 0.0% inorganic N). Using N completely via inorganic N significantly was superior than using N via 100% organic source in stimulating these growth aspects. Using N as 25 % inorganic N+ 75% poultry manure tea+ 200 ml EM/palm/year significantly enhanced these growth traits over the application of N completely via organic N. The promotion on these growth attributes was significantly related to the increase in poultry manure tea levels from 25 to 50% and EM from 50 to 100 ml/palm/year and the reduce in percentages of inorganic N from 75 to 50 %. The lowest values were recorded on the palms that received N as 100% organic N (100% poultry manure tea) alone. Supplying the palms with N as 50% inorganic N+ 50% poultry manure tea+ 100 ml EM/palm/year gave the highest values of leaflet length **(42.9 & 44.0 cm)**, leaflet width **(4.3 & 4.4 cm)**, area of leaflet **(0.013 & 0.014 cm^2)**, leaf length **(4.39 & 4.41 m)**, leaf width **(0.64 & 0.67 m)**, leaflet number/leaf **(173.0 & 176.0 leaflet)**, leaf area **(2.25 & 2.46 cm^2)**, total surface area per palm **(180.0 % 191.5 cm^2)**, number of spines/ leaf **(23.0 & 24.0 spines)** and spine length **(13.3 & 13.5 cm)** during both seasons, respectively. These results were true during both seasons.

2- Leaf chemical components:

It is clear from the obtained data in Tables (4 & 5) that supplying the palms with N as 0.0 to 75 % inorganic N+ 25 to 100% poultry manure tea+ 50 to 200 ml EM/palm/year significantly enhanced all leaf chemical components (total carbohydrates, N, P, K, Mg, Ca, Zn, Fe, Mn, chlorophyll a & b, total chlorophylls and total carotenoids) relative to the application of N via 100% inorganic N. The promotion on these leaf chemical components was significantly associated with reducing the percentages of inorganic N from 75% to 0.0% and at the same time increasing the percentages of organic N from 25 to 100% and EM from 50 to 200 ml EM/palm. The maximum values of total carbohydrates (18.7 & 18.5%), N (1.97 & 1.99%), P (0.27 & 0.29%), K (1.50 & 1.50%), Mg (0.80 & 0.79%), Ca (2.60 & 2.64%), Zn (73.0 & 72.9 ppm), Fe (60.0 & 62.1 ppm), Mn (63.0 & 63.9 ppm), chlorophyll a (4.01 & 3.96 mg/1 g FW) chlorophyll b (1.46 & 1.44 mg/1 g FW), total chlorophylls (5.47 & 5.40 mg/1 g FW) and total carotenoids (1.41 & 1.39 mg/1 g FW) during both seasons, respectively were recorded on the palms that received N as 100% poultry manure tea+ 200 ml EM/palm/year. The lowest values were recorded on the palms that supplied with N as 100% inorganic N alone. The ratio between total carbohydrates and N was significantly unaffected by different N management. Similar results were announced during both seasons.

3- Fruit setting.:

It is noticed from the obtained data in Tables (5 & 6) that supplying the palms with N as 50 to 75 % inorganic N+ 25 to 50% poultry manure tea+ 50 to 100 ml EM/palm/year significantly improved girth and length of spathe, number of strands/spathe, number of flowers and fruits per strand and percentages of initial fruit setting and fruit retention relative to using N as 100% inorganic N, 100% poultry manure tea or when N was added via 25% inorganic N+ 75% poultry manure tea+150 ml EM/palm/year. Using N as 100% inorganic N was significantly favourable than using N via 100% poultry manure tea+200 ml EM/palm/year in

improving these parameters. Supplying the palms with N via 100% inorganic N alone was significantly superior than using N as 25% inorganic N+ 75% poultry manure tea+150 ml EM/palm/year in improving these parameters. The maximum values of initial fruit setting (71.2 & 72.3%) and fruit retention (47.0 & 46.9%) were recorded on the palms that received N as 50% inorganic N+ 50% poultry manure tea+100 ml EM/palm/year. Supplying the palms with 100% poultry manure tea+200 ml EM/palm/year gave the minimum values. These results were true during both seasons.

4- The yield and bunch weight:

It is clear from the obtained data in Table (6) that yield/ palm and bunch of Sakkoti date palms were significantly varied among the five N management. Both parameters were significantly improved with using N via 50 to 75 % inorganic N+ 25 to 50% poultry manure tea+ 50 to 100 ml EM/palm/year compared with the other N management. Using N as 100% inorganic N was significantly preferable than using N completely via poultry manure tea+ 200 ml EM/palm/year in improving yield and bunch weight. There was a gradual promotion on such two parameters with reducing inorganic N percentages from 100 to 50% and at the same time increasing the percentages of poultry manure tea from 25 to 50% and levels of EM from 50 to 100 ml/palm/year. A significant reduction on the yield and bunch weight was observed with reducing the percentages of inorganic N from 50 to 25% even with the application of EM at 150 to 200 ml/palm/year. The highest values of yield (160.0 & 168.0 kg) and bunch weight (16.0 & 16.8 kg) were recorded on the palms that received N as 50% inorganic N+ 50% poultry manure tea+100 ml EM/palm/year during both seasons, respectively. The palms received N as 100% poultry manure tea+200 ml EM/palm/year gave the lowest values of yield (70.0 & 71.0 kg) and bunch weight (7.0 & 7.1 kg) during both seasons, respectively. These results were true during both seasons.

5- Physical and chemical characteristics of the fruits:

It is clear from the obtained data in Tables (6 & 7) that supplying Sakkoti date palms with N via 0.0 to 75 % inorganic N+ 25 to 100% poultry manure tea+ 25 to 200 ml EM/palm/year significantly improved both physical and chemical characteristics of the fruits in terms of increasing weight, volume, diameter and height of fruit, fruit flesh %, edible to non-edible portions, T.S.S., total, reducing and non–reducing sugars and decreasing fruit seed weight %, seed length, total acidity%, total crude fibre, total soluble tannins as well as nitrite and nitrate in the flesh compared to using N completely via inorganic N. The promotion on fruit quality was significantly correlated to the reduction on the percentages of inorganic N from 100 to 0.0% and the increase on the percentages of poultry manure tea from 0.0 to 100% and levels of EM from 0.0 to 200 ml/palm/year. Amending the palms with N as 100% poultry manure tea+ 200 ml EM/palm/year gave the beat results with regard to quality of the fruits. Unfavourable effects on fruit quality were recorded on the palms that received N as 100% inorganic N alone. These results were true during both seasons.

Table (3): Effect of poultry manure tea and effective microorganisms (EM) as a partial replacement of inorganic N on some vegetative growth characteristics of Sakkoti date palms during 2016 and 2017 seasons.

Treatments	Leaflet length (cm)		Leaflet width (cm)		Leaflet area (cm^2)		Leaf length (cm)		Leaf width (cm)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
1- N as 100% inorganic	38.9	40.0	3.6	3.7	0.010	0.011	4.00	3.99	0.51	0.50
2- N as 75% inorganic+ 25% P.M+ 50 ml EM	40.7	41.8	3.9	4.0	0.012	0.012	4.25	4.26	0.58	0.60
3- N as 50% inorganic+ 50% PM+100 ml EM	42.9	44.0	4.3	4.4	0.013	0.014	4.39	4.41	0.64	0.67
4- N as 25% inorganic+ 75% P.M+ 150 ml EM	36.9	38.0	3.2	3.3	0.009	0.009	3.84	3.80	0.35	0.36
5- N as 100% P.M+ 200 ml EM	35.1	36.2	2.9	3.0	0.008	0.008	3.75	3.70	0.27	0.29
New L.S.D. at 5%	**0.6**	**0.8**	**0.2**	**0.3**	**0.002**	**0.003**	**0.04**	**0.05**	**0.06**	**0.09**

Treatments	Leaflet number/ leaf		Leaf area (cm^2)		Total surface area of palm (m2)		No. of spines per leaf		Spine length (cm.)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
1- N as 100% inorganic	166.0	167.0	1.66	1.69	132.8	147.2	18.0	18.0	11.7	11.8
2- N as 75% inorganic+ 25% P.M+ 50 ml EM	170.0	172.0	2.04	2.06	163.2	164.8	20.0	21.0	12.5	12.7
3- N as 50% inorganic+ 50% PM+100 ml EM	173.0	176.0	2.25	2.46	180.0	191.5	23.0	24.0	13.3	13.3
4- N as 25% inorganic+ 75% P.M+ 150 ml EM	163.0	163.0	1.30	1.30	104.0	104.0	16.0	16.0	10.7	10.7
5- N as 100% P.M+ 200 ml EM	160.0	160.0	0.32	0.48	25.6	35.4	15.0	14.0	9.9	10.0
New L.S.D. at 5%	**2.0**	**2.0**	**0.18**	**0.21**	**11.6**	**12.0**	**1.0**	**1.0**	**0.6**	**0.7**

P.M= Poultry manure (2.5% N).

Table (4): Effect of poultry manure tea and effective microorganisms (EM) as a partial replacement of inorganic N on some leaf chemical components of Sakkoti date palms during 2016 and 2017 seasons.

Treatments	Leaf total carbohydrate %		Leaf N %		C/ N		Leaf P %		Leaf K %	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
1- N as 100% inorganic	15.1	14.9	1.66	1.59	9.1	9.4	0.12	0.12	1.19	1.20
2- N as 75% inorganic+ 25% P.M+ 50 ml EM	16.0	16.2	1.73	1.71	9.2	9.5	0.16	0.17	1.27	1.29
3- N as 50% inorganic+ 50% PM+100 ml EM	16.9	17.0	1.84	1.83	9.2	9.3	0.20	0.21	1.35	1.37
4- N as 25% inorganic+ 75% P.M+ 150 ml EM	18.0	17.7	1.91	1.92	9.4	9.2	0.24	0.26	1.42	1.44
5- N as 100% P.M+ 200 ml EM	18.7	18.5	1.97	1.99	9.5	9.3	0.27	0.29	1.50	1.52
New L.S.D. at 5%	**0.7**	**0.9**	**0.05**	**0.07**	**NS**	**NS**	**0.02**	**0.03**	**0.05**	**0.06**

Treatments	Leaf Mg %		Leaf Ca %		Leaf Zn (ppm)		Leaf Fe (ppm)		Leaf Mn (ppm)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
1- N as 100% inorganic	0.55	0.53	2.11	2.04	60.0	59.3	50.0	49.8	50.0	49.9
2- N as 75% inorganic+ 25% P.M+ 50 ml EM	0.61	0.59	2.21	2.20	63.0	62.9	52.3	53.0	53.7	54.0
3- N as 50% inorganic+ 50% PM+100 ml EM	0.67	0.66	2.33	2.35	67.5	67.6	55.0	56.0	57.1	58.0
4- N as 25% inorganic+ 75% P.M+ 150 ml EM	0.75	0.74	2.45	2.50	70.4	70.6	56.9	59.0	60.0	60.5
5- N as 100% P.M+ 200 ml EM	0.80	0.79	2.60	2.64	73.0	72.9	60.0	62.1	63.0	63.9
New L.S.D. at 5%	**0.03**	**0.04**	**0.09**	**0.10**	**2.1**	**2.2**	**1.9**	**2.1**	**2.3**	**2.4**

P.M= Poultry manure (2.5% N).

Table (5): Effect of poultry manure tea and effective microorganisms (EM) as a partial replacement of inorganic N on leaf pigments, girth and length of spathe, number of strains/spathe, number of flowers and fruits/ strand and percentage of initial fruit setting of Sakkoti date palms during 2016 and 2017 seasons.

Treatments	Chlorophyll a (mg/1.0 g F.W)		Chlorophyll b (mg/1.0 g F.W)		Total chlorophylls (mg/1.0 g F.W)		Total carotenoids (mg/1.0 g F.W)		Spathe girth (cm)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
1- N as 100% inorganic	3.11	3.01	1.11	1.14	4.22	4.15	1.12	1.09	22.0	23.0
2- N as 75% inorganic+ 25% P.M+ 50 ml EM	3.31	3.28	1.18	1.20	4.49	4.48	1.18	1.17	24.5	26.0
3- N as 50% inorganic+ 50% PM+100 ml EM	3.55	3.49	1.27	1.30	4.82	4.79	1.25	1.23	27.0	28.0
4- N as 25% inorganic+ 75% P.M+ 150 ml EM	3.85	3.79	1.39	1.41	5.24	5.20	1.32	1.31	19.9	20.3
5- N as 100% P.M+ 200 ml EM	4.01	3.96	1.46	1.44	5.47	5.40	1.41	1.39	18.0	18.0
New L.S.D. at 5%	**0.14**	**0.15**	**0.05**	**0.06**	**0.18**	**0.17**	**0.04**	**0.06**	**1.7**	**1.5**

Treatments	Spathe length (cm)		No. of strands /spathe		No. of flowers/ strand		No. of fruits/ strand		Initial fruit setting %	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
1- N as 100% inorganic	55.0	55.9	82.9	83.7	48.0	49.6	29.0	29.9	59.0	59.9
2- N as 75% inorganic+ 25% P.M+ 50 ml EM	60.0	61.9	90.0	91.2	55.0	56.7	38.0	39.0	65.9	67.0
3- N as 50% inorganic+ 50% PM+100 ml EM	67.5	69.5	94.9	96.6	59.0	60.8	41.9	43.0	71.2	72.3
4- N as 25% inorganic+ 75% P.M+ 150 ml EM	52.9	55.0	76.0	78.0	44.0	45.6	26.0	27.0	47.0	48.0
5- N as 100% P.M+ 200 ml EM	50.0	51.9	70.0	71.9	40.0	41.7	23.0	24.0	41.0	41.1
New L.S.D. at 5%	**3.5**	**3.2**	**4.9**	**5.1**	**3.1**	**2.9**	**2.9**	**3.3**	**4.2**	**4.3**

P.M= Poultry manure (2.5% N).

Table (6): Effect of poultry manure tea and effective microorganisms (EM) as a partial replacement of inorganic N on fruit retention %, yield/palm (kg), bunch weight (kg) as well as some physical quality characteristics in the fruits of Sakkoti date palms during 2016 and 2017 seasons.

Treatments	Fruit retention %		Yield per palm (kg.)		Bunch weight (kg.)		Fruit weight (g.)		Fruit volume (cm3)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
1- N as 100% inorganic	37.9	38.0	125.0	130.0	12.5	13.0	8.9	9.0	9.2	9.3
2- N as 75% inorganic+ 25% P.M+ 50 ml EM	42.1	41.9	142.0	147.0	14.2	14.7	9.4	9.6	9.7	10.0
3- N as 50% inorganic+ 50% PM+100 ml EM	47.0	46.9	160.0	168.0	16.0	16.8	9.9	10.3	10.2	10.6
4- N as 25% inorganic+ 75% P.M+ 150 ml EM	33.0	32.8	90.0	89.0	9.0	8.9	10.5	10.9	10.8	11.2
5- N as 100% P.M+ 200 ml EM	28.2	28.0	70.0	71.0	7.0	7.1	10.9	11.6	11.2	11.9
New L.S.D. at 5%	**3.3**	**2.9**	**7.3**	**8.1**	**1.5**	**1.6**	**0.4**	**0.6**	**0.5**	**0.5**

Treatments	Fruit diameter (cm)		Fruit height (cm)		Seed weight %		Fruit flesh %		Seed length (cm)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
1- N as 100% inorganic	1.9	2.0	3.9	4.0	7.8	7.6	92.2	92.4	3.3	3.1
2- N as 75% inorganic+ 25% P.M+ 50 ml EM	1.2	1.3	4.3	4.3	7.0	7.1	93.0	92.9	3.1	2.8
3- N as 50% inorganic+ 50% PM+100 ml EM	1.6	1.8	4.7	4.8	6.6	6.5	93.4	93.5	2.8	2.5
4- N as 25% inorganic+ 75% P.M+ 150 ml EM	1.9	2.1	5.2	5.3	6.0	6.1	94.0	93.9	2.4	2.3
5- N as 100% P.M+ 200 ml EM	2.2	2.5	5.6	5.7	5.7	5.6	94.3	94.4	2.0	2.0
New L.S.D. at 5%	**0.2**	**0.2**	**0.3**	**0.3**	**0.3**	**0.4**	**0.4**	**0.4**	**0.2**	**0.2**

P.M= Poultry manure (2.5% N).

Table (7): Effect of poultry manure tea and effective microorganisms (EM) as a partial replacement of inorganic N on edible/ non edible portions of the fruits and some chemical characteristics of the fruits of Sakkoti date palms during 2016 and 2017 seasons.

Treatments	Edible to non-edible portions		T.S.S. %		Total sugars %		Reducing sugars %		Non- reducing sugars %	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
1- N as 100% inorganic	11.8	12.2	68.0	67.9	57.0	58.1	11.8	12.0	45.2	46.1
2- N as 75% inorganic+ 25% P.M+ 50 ml EM	13.3	13.1	70.0	70.9	58.9	60.0	12.3	12.5	46.6	47.5
3- N as 50% inorganic+ 50% PM+100 ml EM	14.2	14.4	71.9	72.6	60.1	61.2	13.1	13.3	47.0	47.9
4- N as 25% inorganic+ 75% P.M+ 150 ml EM	15.7	15.4	73.7	74.0	62.2	63.4	14.0	14.2	48.2	49.2
5- N as 100% P.M+ 200 ml EM	16.5	16.9	75.0	76.2	64.0	65.1	14.5	15.0	49.5	50.1
New L.S.D. at 5%	**0.7**	**0.8**	**1.1**	**1.3**	**0.9**	**1.0**	**0.4**	**0.4**	**0.4**	**0.4**

Treatments	Total acidity %		Crude fibre %		Total soluble tannins %		Nitrite (ppm)		Nitrate (ppm)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
1- N as 100% inorganic	0.340	0.344	1.11	1.06	0.99	0.94	1.99	1.71	6.1	6.5
2- N as 75% inorganic+ 25% P.M+ 50 ml EM	0.318	0.322	1.06	1.00	0.94	0.90	1.90	1.60	5.4	5.0
3- N as 50% inorganic+ 50% PM+100 ml EM	0.294	0.293	1.00	0.97	0.90	0.87	1.64	1.51	4.0	3.9
4- N as 25% inorganic+ 75% P.M+ 150 ml EM	0.271	0.269	0.94	0.90	0.81	0.82	1.50	1.41	3.0	2.6
5- N as 100% P.M+ 200 ml EM	0.250	0.249	0.88	0.85	0.71	0.69	1.01	1.01	1.3	1.1
New L.S.D. at 5%	**0.018**	**0.016**	**0.02**	**0.02**	**0.03**	**0.02**	**0.5**	**0.4**	**0.6**	**0.5**

P.M= Poultry manure (2.5% N).

4. Discussion

The previous promoting action on growth and fruiting of Sakkoti date palms was mainly attributed Fe the essential roles of EM (effective microorganisms (**El- Haddad *et al,* 1993; Sangakkara and Higa, 1994; Chowdhury *et al,* 1994 and Kannaiyan, 2002)**, and organic fertilizers (**Angers *et al,* 1995; Marschner, 1995; Goramnagar *et al,* 2000; Vercesi, 2000 and Bonanzinga *et al,* 2001**) in reducing expenses of mineral N, air, soil, water and plant pollution; soil born pathogens, problems of salinity, soil pH, leaching process and soil erosion and enhancing the production of growth promoting substances i.e. IAA, GA_3 and cytokinins, root development, nutrients availability and uptake, soil organic matter and microbial activity, soil aggregation and aeration, permeability of soil, water holding capacity, nutrient transport, photosynthesis process, fixation of N, photosynthesis, water use efficiency, vitamins B, solubility of most nutrients, soil workability, resistantce to drought buffering property of the soil, formation of heavy metal complexes, breaking of hazard chemicals, biosynthesis of estrate, formation of hummus, tolerance to draught and temperature extremes, the release of various nutrients, oxidation of sulphur complexes and converting insoluble sulphur to soluble one.

The promoting effect of inorganic N and organic N fertilization on fruiting of Sakkoti date palms was confirmed by the results of **(Osman, 2003; Mansour *et al.,* 2004; Mohamed and Ragab, 2004; Mohamed and Gobara, 2004; Gobara and Ahmed, 2004; Abdel El-Hameed and Rsgab, 2004; El-Salhy, 2008; Al-Wasfy and El-Khawaga, 2008; Ibrahiem- Zeneib, 2010; Souna-Faiza *et al,* 2010; Roshdy, 2010; Saied, 2011; Mahfouz, 2011; Saad *et al,* 2011; Faraag, 2013; Ahmed *et al.,* 2014 a & b and Omar, 2015)** on different date palm cultivars.

These results regarding the promoting effect of EM on growth and yield are in harmony with those obtained by **Abd-Rabou, 2006; Formowitz *et al,* 2007; Ahmed- Samah, 2011; Roshdy *et al,* 2011; Ibrahiem, 2012; Refaai and Ahmed, 2013 and Ahmed *et al.,* 2014 a & b**).

5. Conclusion:

Under the experimental and resembling conditions, it is advised to fertilize mature Sakkoti date palms with the suitable N (1000 g MN/ palm/ year) through 50% inorganic (1493 g ammonium nitrate, 33.5 % N) at the first week of March, May and July besides poultry manure (2.5 % N) applied once at the first week of Jan. and Effective microorganisms (EM) at 100 ml/ palm/ year once at the first week of March for improving yield quantitively and qualitively and at the same time reducing fruit nitrite and nitrate pollution. Under such recommendation, it is possible fro replacing 50% of mineral N fertilizers by 50% poultry manure and 100 ml/ EM / palm/ year.

In a sustainable or organic date palm culture, the application of organic and biofertilizers products such as poultry manure and effective microorganisms (EM) which can be a note worthy alternative of different chemical and have prospects for a possible economical use.

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